

REPORT NUMBER 103-GTL-04-001

**SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 103
WINDSHIELD DEFROSTING AND
DEFOGGING SYSTEMS**

**GENERAL MOTORS CORP.
2004 CHEVROLET MALIBU, PASSENGER CAR
NHTSA NO. C40102**

**GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443**



SEPTEMBER 13, 2004

FINAL REPORT

PREPARED FOR

**U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2004 Chevrolet Malibu Passenger Car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 103 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-103-13 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, "Windshield Defrosting and Defogging Systems – Passenger Vehicles, Multipurpose Vehicles, Trucks and Buses".

1.1 TEST VEHICLE

The test vehicle was a 2004 Chevrolet Malibu Passenger Car. Nomenclature applicable to the test vehicle are:

- A. Vehicle Identification Number: 1G1ZT52814F125082
- B. NHTSA No.: C40102
- C. Manufacturer: GENERAL MOTORS CORPORATION
- D. Manufacture Date: 10/03

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 103 testing on August 4-5, 2004.

SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2004 Chevrolet Malibu 4-door passenger car, NHTSA No. C40102 was subjected to FMVSS No. 103 tests on August 4-5, 2004. Photographs of the test vehicle are shown in Figures 5.1 through 5.4. The manufacturer's certification and tire information labels are shown in Figures 5.5 and 5.6. The test instrumentation and instrument panel setups are depicted in Figures 5.7 and 5.8. Figures 5.9 through 5.14 depict the windshield pre and post test defrost conditions.

2.1 TEST PROCEDURE

Prior to test the test vehicle was inspected for completeness, systems operability, and appropriate fuel and liquid levels, i.e., oil and coolant to include antifreeze protection. The vehicle was then photographically documented as required by the DOT/NHTSA test procedure. The windshield patterns for areas A, B and C had been furnished prior to testing and these areas were outlined on the windshield with a marker. The vehicle was then installed in the cold chamber and pre-conditioned for a 14-hour minimum, $0^{\circ} \pm 5^{\circ}$ F temperature soak for the first test run. After the pre-condition, the hood was raised to assure engine coolant and lubricant were stabilized within the test temperature range for a minimum of 2 hours.

At the end of the 2-hour minimum stabilization period, the entire windshield was sprayed evenly with 0.010 ounces of water per square inch of glass area. Refer to Section 3, Compliance Test Data, for test specifics such as total amount of water sprayed, spray gun identification, and air pressure regulation. The vehicle soak continued for an additional 30 minutes minimum but no more than 40 minutes after the windshield was sprayed.

At the conclusion of the additional soak time the vehicle's engine was started and operated at a target speed of 1500 to 1800 rpm or at the manufacturer's specification if different as noted on data sheets. The defroster blower was turned on to the high speed setting with the heater selector in the de-ice (defrost) position, and the temperature control in the maximum temperature position. All doors and windows were closed. The heater air intake was fully open and the vehicle's hood closed. At no time during the test were the windshield wipers used.

SECTION 2 continued

At start of testing and during test, at each 5-minute interval after engine start, cold chamber, engine coolant, heater coolant in and defroster air left/defroster air right temperatures were recorded. Likewise at each 5-minute interval the boundary of the defrosted area was marked on the inside surface of the windshield. The test was run for a maximum of 40 minutes from engine start, or until such time as 100 percent windshield clearance was achieved. Photographs were made of the windshield at the pre-test frosted state and 20-minute and 25-minute intervals. Post test actions included placing a vellum pattern on the windshield and tracing the windshield's 5-minute interval defrosted area boundary lines onto the vellum pattern.

After the traces were obtained, the windshield was again thoroughly cleaned and the vehicle engine coolant and lubricant stabilization period at $0^{\circ} \pm 5^{\circ}$ F temperature commenced for the second test which entailed a repeat of the procedure discussed. The windshield patterns for both tests were used subsequently to determine the cleared area percentages.

2.2 SUMMARY OF RESULTS

Based on the test performed, the test vehicle appears to be in compliance with the requirements of FMVSS 103.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2004 Chevrolet Malibu.

SUMMARY DATA SHEET
FMVSS 103, WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2004 CHEVROLET MALIBU PASSENGER CAR
 VEH. NHTSA NO: C40102 VIN: 1G1ZT52814F125082
 VEH. BUILD DATE: 10/03 TEST DATE: AUGUST 4-5, 2004
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

WINDSHIELD AREA: 1803 in² AREA C = 238 in² AREA D = 238 in² AREA A = 1034 in²

MANUFACTURER'S WINDSHIELD PATTERN USED: Yes X No _____

ENGINE THERMOSTAT NOMINAL REGULATING TEMPERATURE: 194 °F

HEATER-DEFROSTER SYSTEM INCLUDES AIR CONDITIONER: YES X NO _____

DESCRIBE UNUSUAL FEATURES OF DEFROSTING SYSTEM: _____

DESCRIBE UNUSUAL FEATURES OF TEST CAR: _____

DESIGNATION	AREA PERCENT DEFROSTED					
	TEST 1	TEST 2	AVG	REQ'D	PASS	FAIL
CRITICAL AREA C AT 20 MINUTES	100%	100%	100%	80% MINIMUM	PASS	
PASSENGER AREA D AT 25 MINUTES	100%	100%	100%	80% MINIMUM	PASS	
TOTAL AREA A AT 40 MINUTES	100%	100%	100%	95% MINIMUM	PASS	

REMARKS:

RECORDED BY: *[Signature]*

DATE: 08/17/04

APPROVED BY: *[Signature]*

FMVSS 103 TEST DATA RECORD - TEST RUN NO. 1

VEH. MOD YR/MAKE/MODEL/BODY: 2004 CHEVROLET MALIBU PASSENGER CAR
 VEH. NHTSA NO: C40102; VIN: 1G1ZT52814F125082
 VEH. BUILD DATE: 10/03; TEST DATE: AUGUST 4, 2004
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned 22.5 hours @ $0^{\circ} \pm 5^{\circ}$ F (14 hrs. min.)

Cold Soak Period: 22.5 HOURS

Time engine coolant and lubricant remained stabilized at 0° F: 18 hrs. 0 minutes

Water Spray Gun and Nozzle Type: BINKS #66

Spray Gun Pressure: 50 psi (50 psi \pm 3 psi)

Water used: 18.03 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 35 minutes (30 to 40 minutes)

Engine Speed: 1550 rpm (Target engine speed 1500 to 1600 rpm)

Wind at specified location in front of windshield: 1.0 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	MOTOR VOLTAGE (volts)	TEMPERATURE, $^{\circ}$ F					DEFROSTED AREA, %		
		TEST ROOM	ENGINE WATER	HEATER WATER IN	DEFROSTER AIR		A	C	D
					DRVR	PSGR			
0	12.5	-2.3	-1.1	-1.7	0.8	0.7	0	0	0
5	14.5	-1.3	19.9	95.4	77.3	78.9	0	0	0
10	14.4	1.9	70.1	139.9	123.5	124.4	28.8%	30.2%	18.8%
15	14.2	3.8	110.3	155.5	140.8	158.1	58.1%	90.4%	66.2%
20	14.1	4.6	135.9	171.0	157.5	158.2	100%	100%	100%
25									
30									
35									
40									

REMARKS:

RECORDED BY: [Signature]
 APPROVED BY: [Signature]

DATE: 08/04/04

FMVSS 103 TEST DATA RECORD - TEST RUN NO. 2

VEH. MOD YR/MAKE/MODEL/BODY: 2004 CHEVROLET MALIBU PASSENGER CAR
 VEH. NHTSA NO: C40102; VIN: 1G1ZT52814F125082
 VEH. BUILD DATE: 10/03; TEST DATE: AUGUST 5, 2004
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned N/A hours @ 0° ±5° F (14 hrs. min.)

Cold Soak Period: 16 HOURS

Time engine coolant and lubricant remained stabilized at 0° F: 13 hrs. 0 minutes

Water Spray Gun and Nozzle Type: BINKS #66

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 18.03 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 32 minutes (30 to 40 minutes)

Engine Speed: 1550 rpm (Target engine speed 1500 to 1600 rpm)

Wind at specified location in front of windshield: 1.0 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	MOTOR VOLTAGE (volts)	TEMPERATURE, °F					DEFROSTED AREA, %		
		TEST ROOM	ENGINE WATER	HEATER WATER IN	DEFROSTER AIR		A	C	D
					DRVR	PSGR			
0	13.47	-5.0	-5.0	-5.4	-4.5	-4.4	0	0	0
5	14.5	-3.5	28.8	107.7	90.1	91.2	.9%	0	0
10	14.5	-1.0	78.8	127.5	112.8	113.4	32.2%	33.9%	25.1%
15	14.3	1.0	115.8	159.1	144.8	144.7	81.9%	100%	88.3%
20	14.2	2.8	134.9	170.2	166.7	156.4	100%	100%	100%
25									
30									
35									
40									

REMARKS:

RECORDED BY: [Signature]
 APPROVED BY: [Signature]

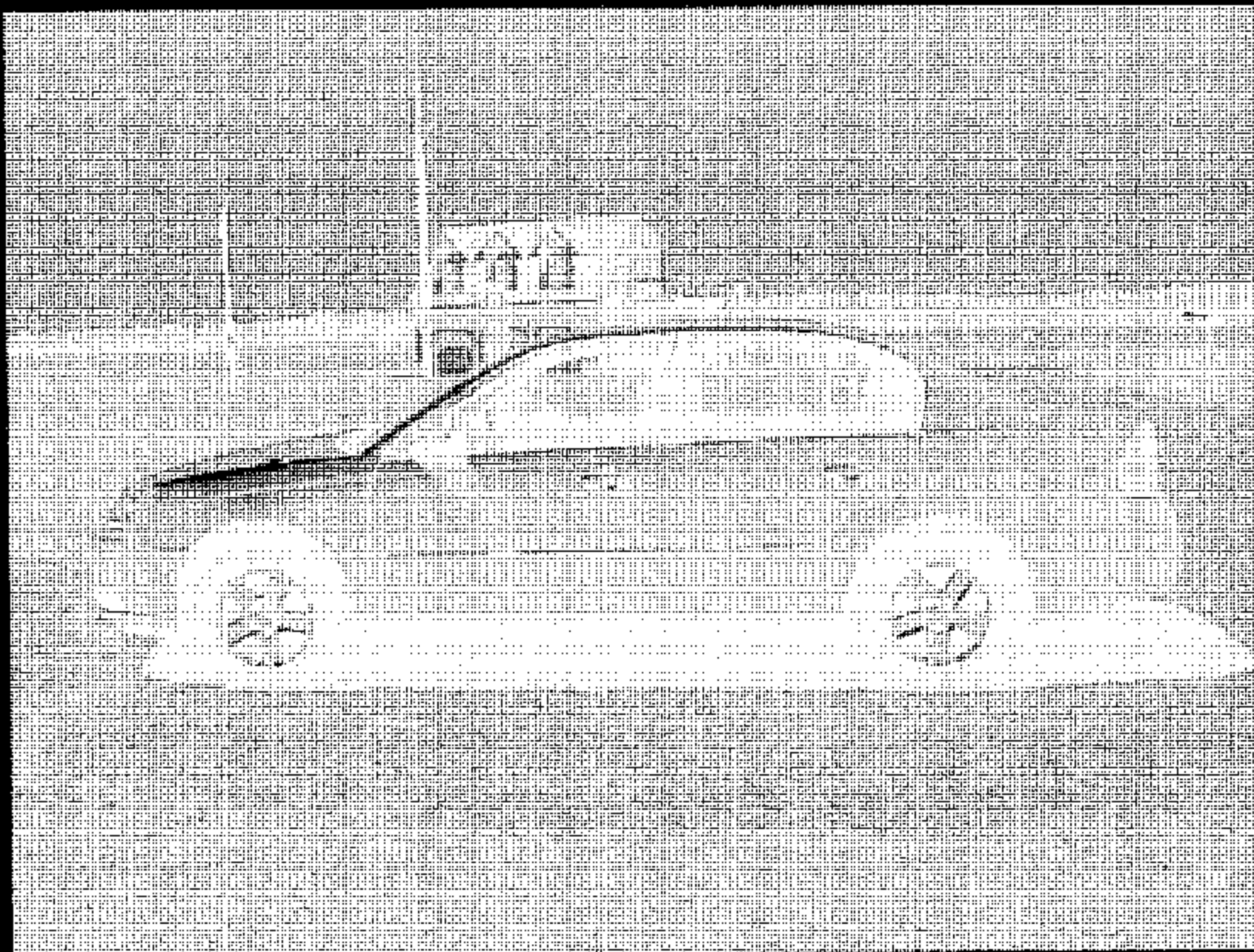
DATE: 08/05/04

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

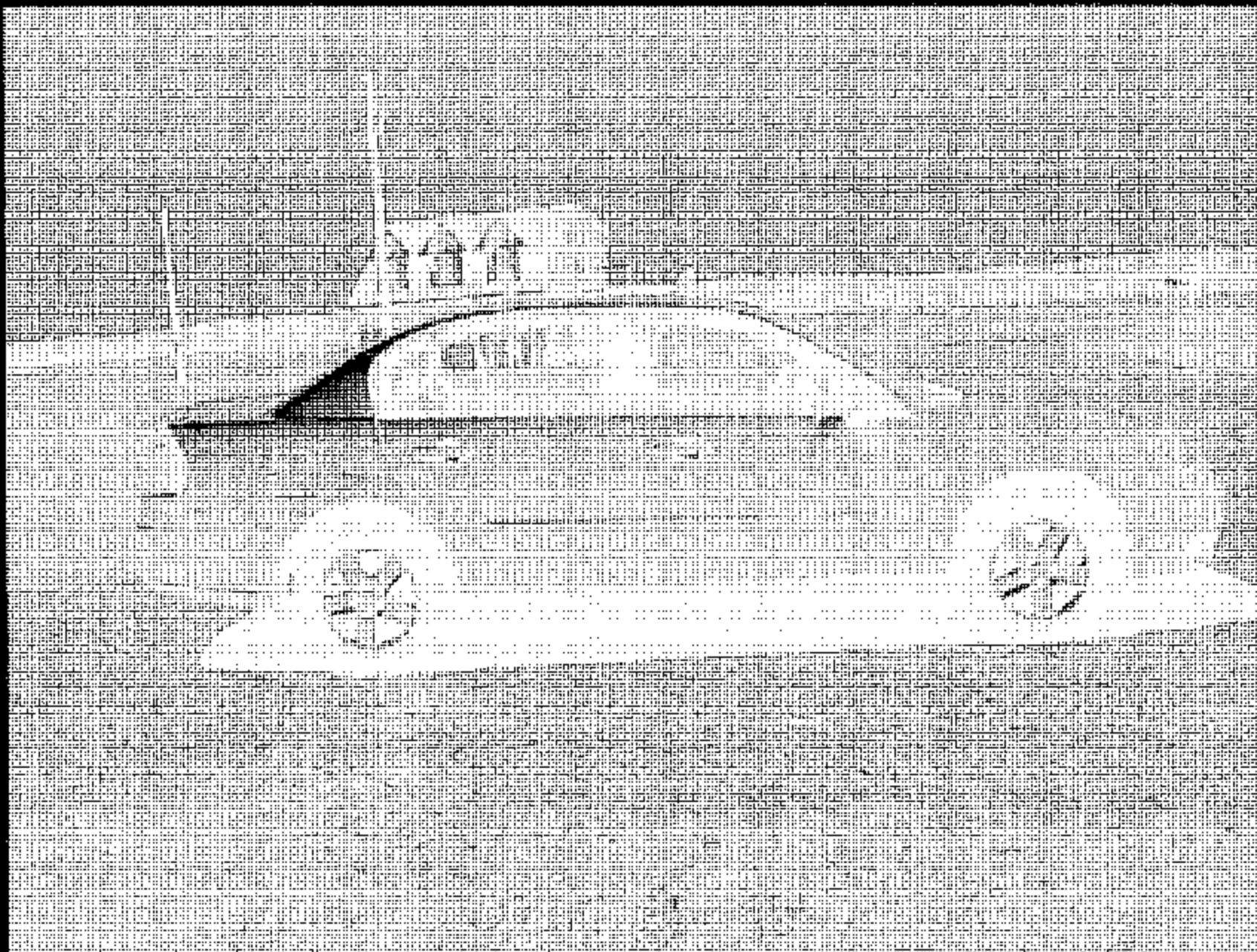
EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
TIMER	ACCU-SPLIT	ACT2	07/04	07/05
TEMPERATURE READOUT	OMEGA	43P	03/04	03/05
TEMPERATURE RECORDER	OMEGA	CT91	03/04	03/05
SPRAY GUN	BINKS	6655	BEFORE USE	BEFORE USE
ANEMOMETER	HASTINGS	RM-1, 46	05/04	05/05
AIR PRESSURE GAGE	BINKS	0-160	02/04	02/05
SCALE	METTLER	200A4M	02/04	02/05
TACHOMETER	MONARCH	ACT-3	07/04	07/05
GRADUATED BEAKER	PHOTAX	N/A	N/A	N/A
EVENT RECORDER	COMPUTER	GEO1	BEFORE USE	BEFORE USE
DATA LOGGER	FLUKE	7471026	03/04	03/05

SECTION 5
PHOTOGRAPHS



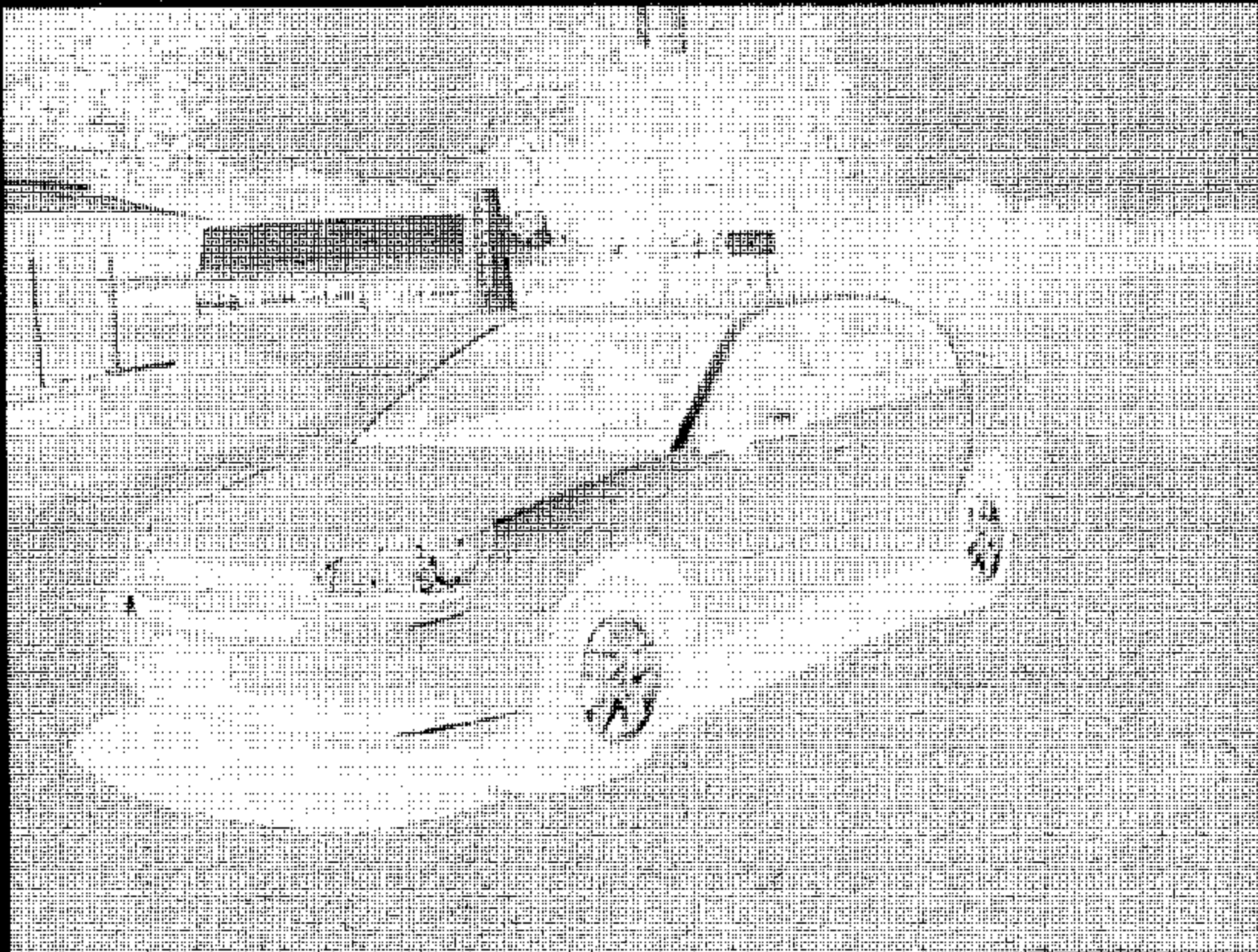
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE



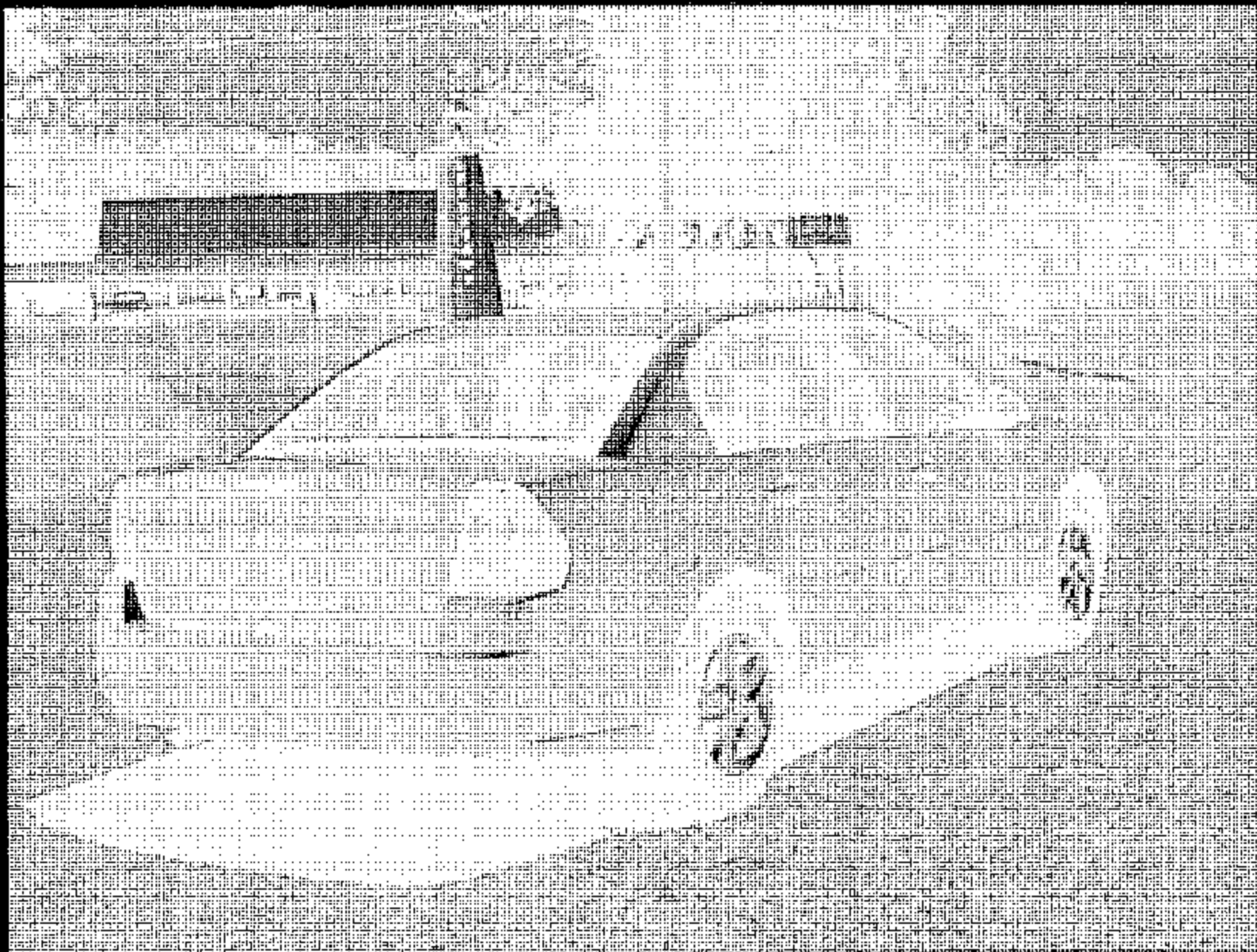
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE



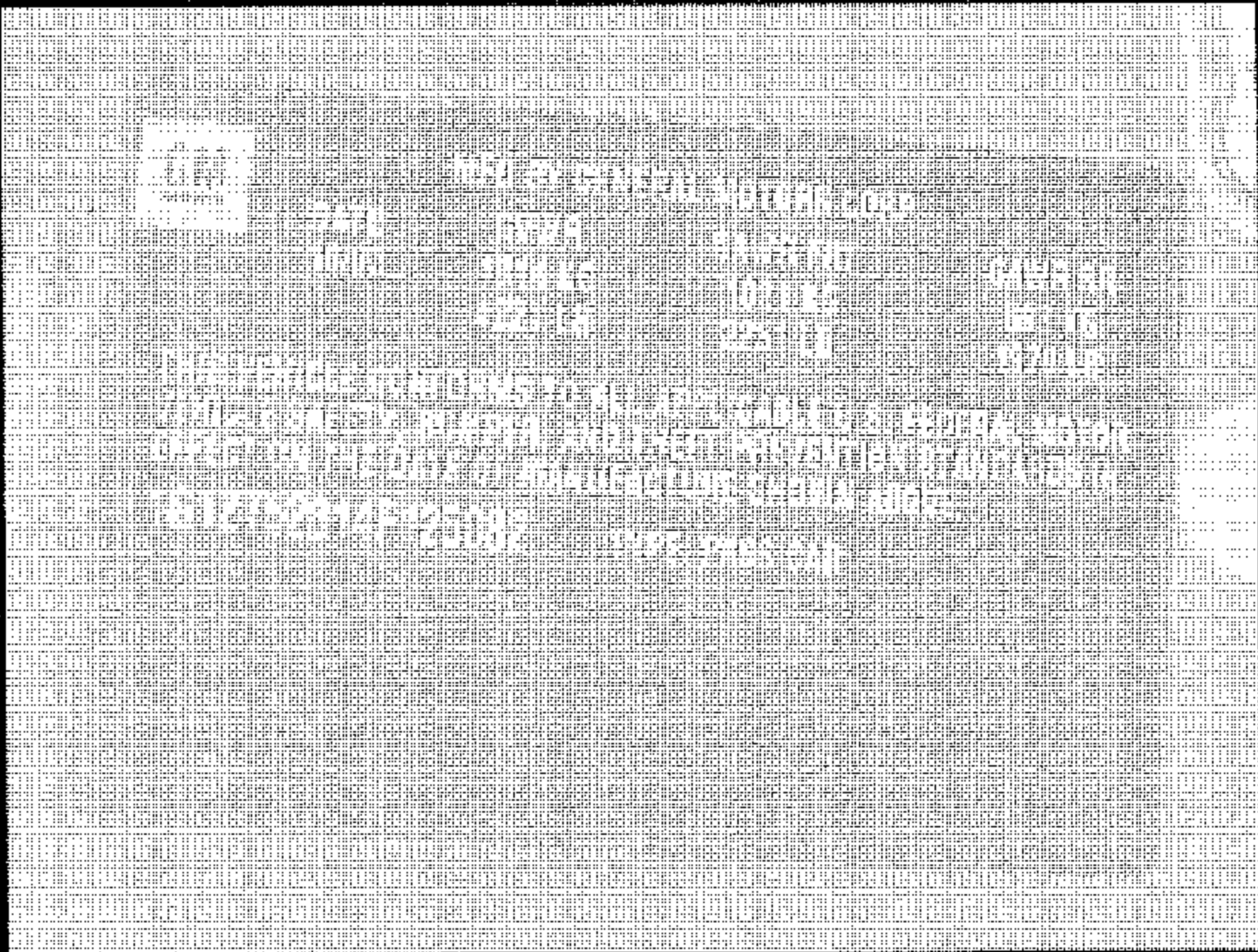
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF
VEHICLE



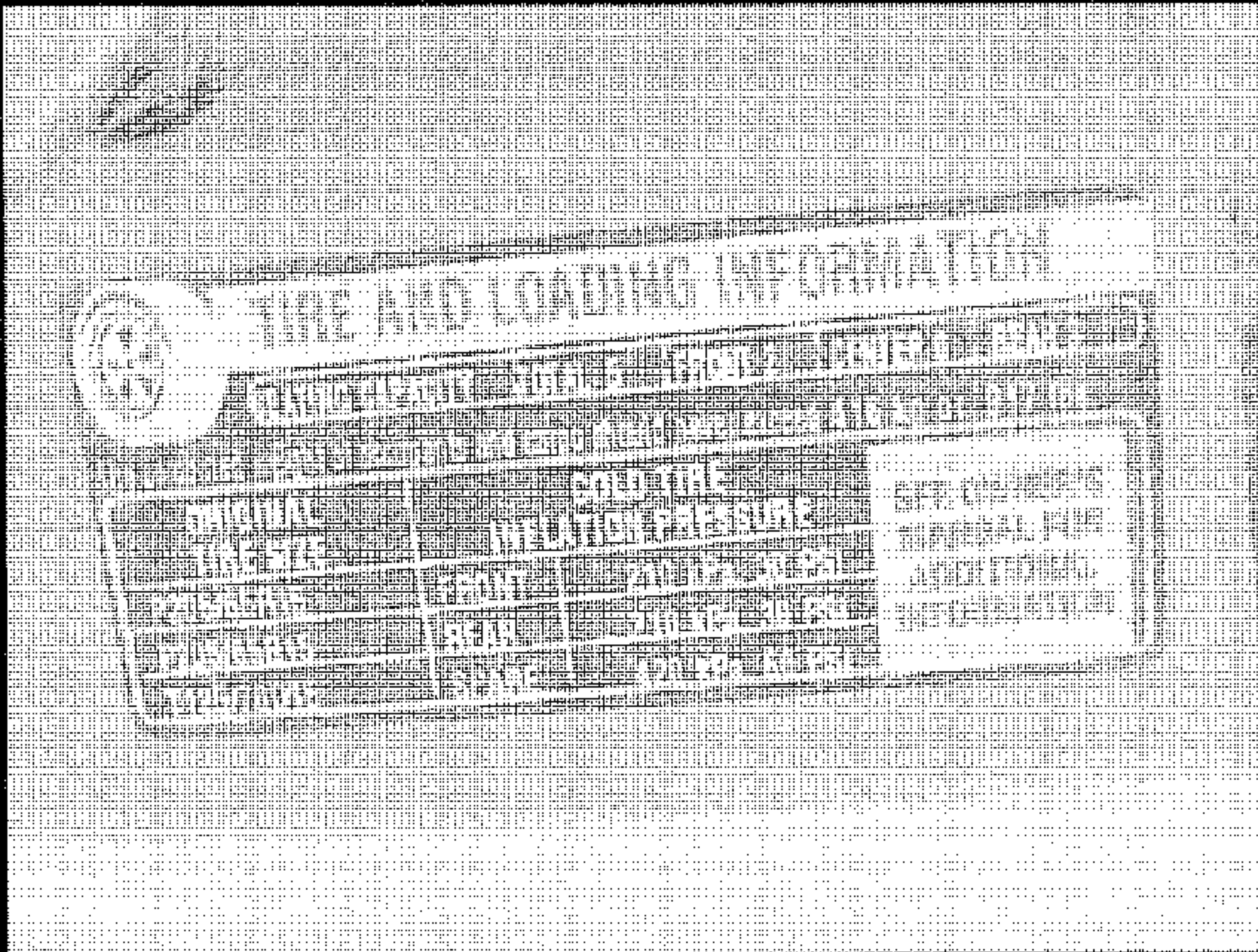
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE OF
VEHICLE



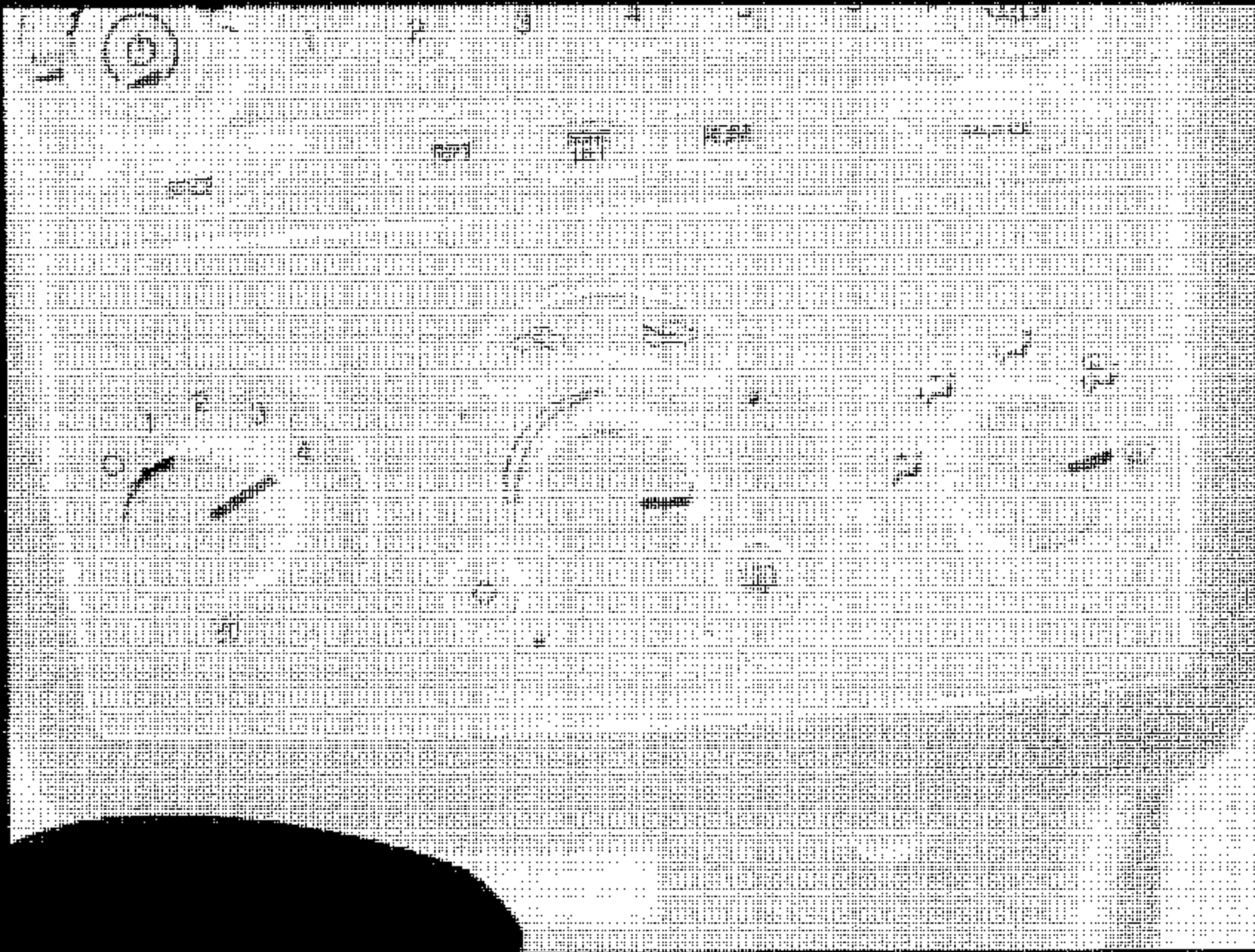
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.5
VEHICLE CERTIFICATION LABEL



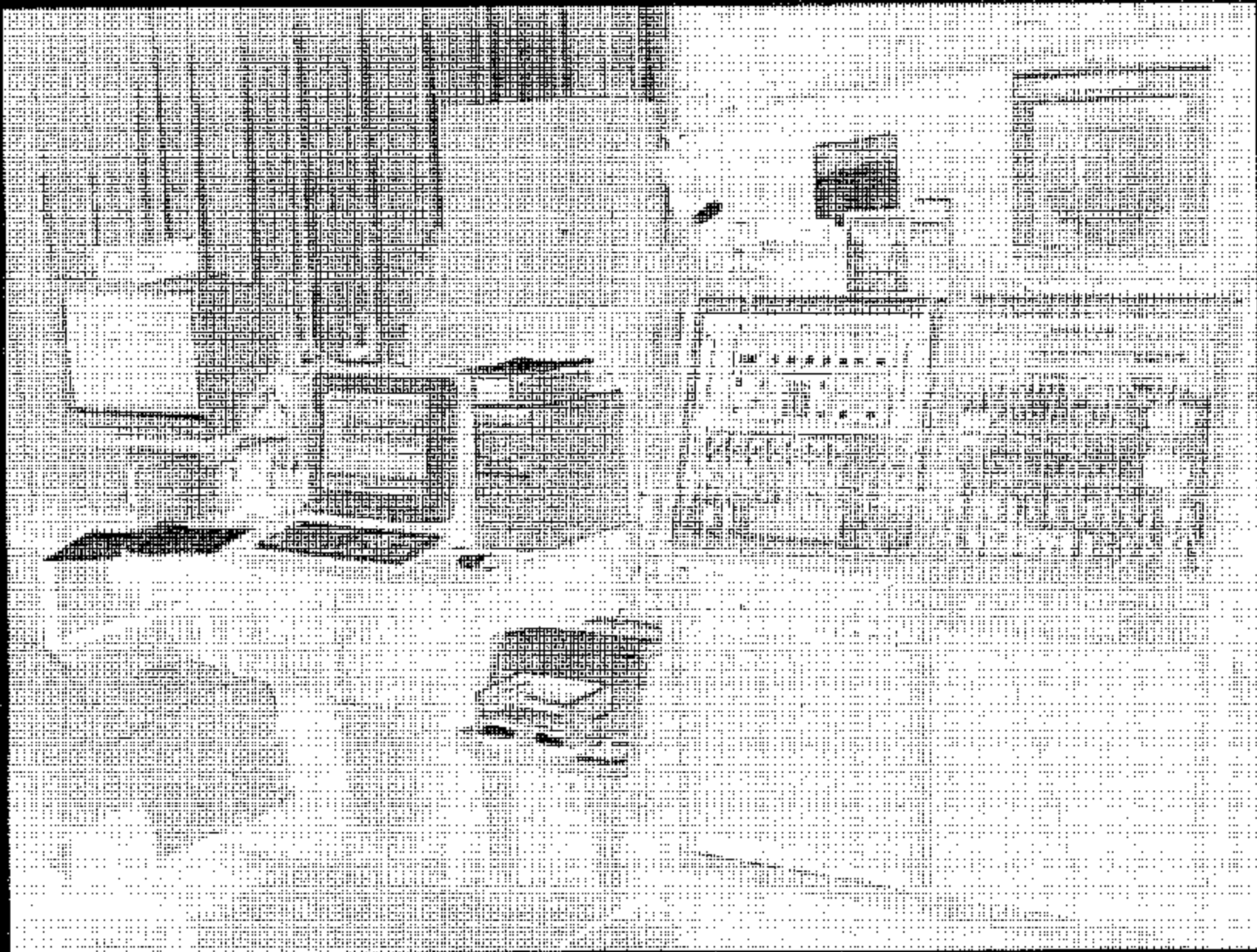
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.8
VEHICLE TIRE INFORMATION LABEL



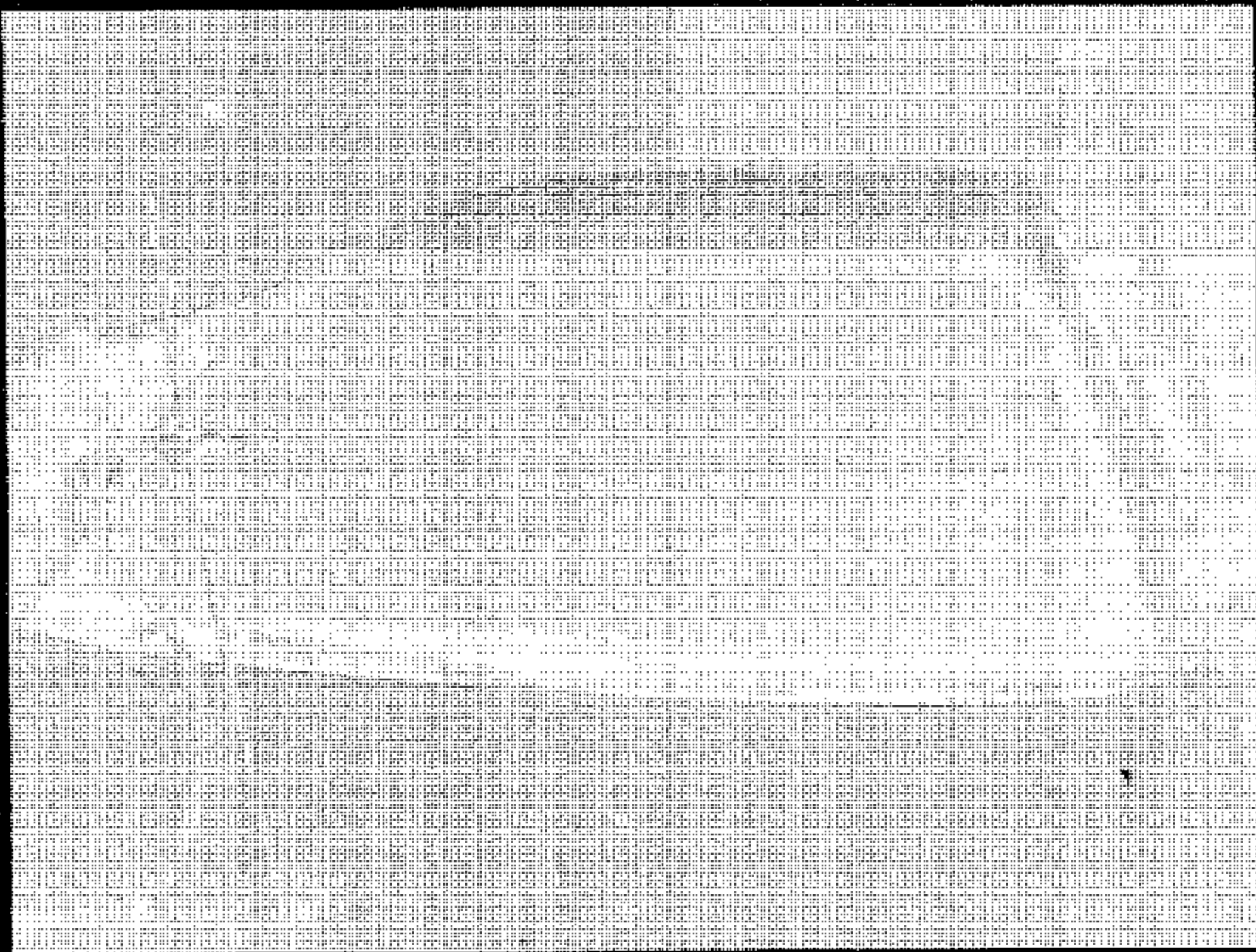
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.7
CLOSE-UP VIEW OF DEFROSTER
CONTROL SETTING ON DASH



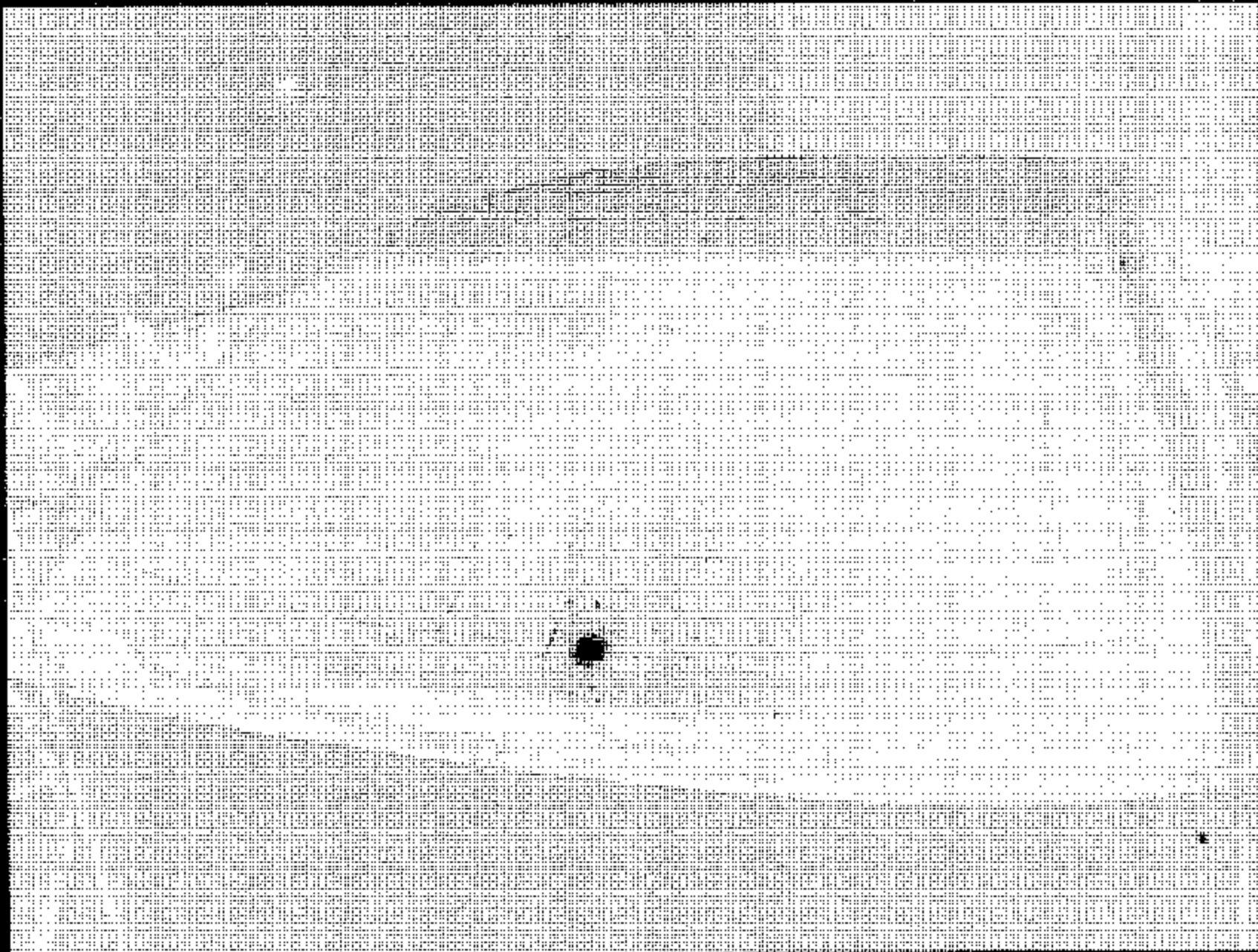
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.8
INSTRUMENTATION SET-UP



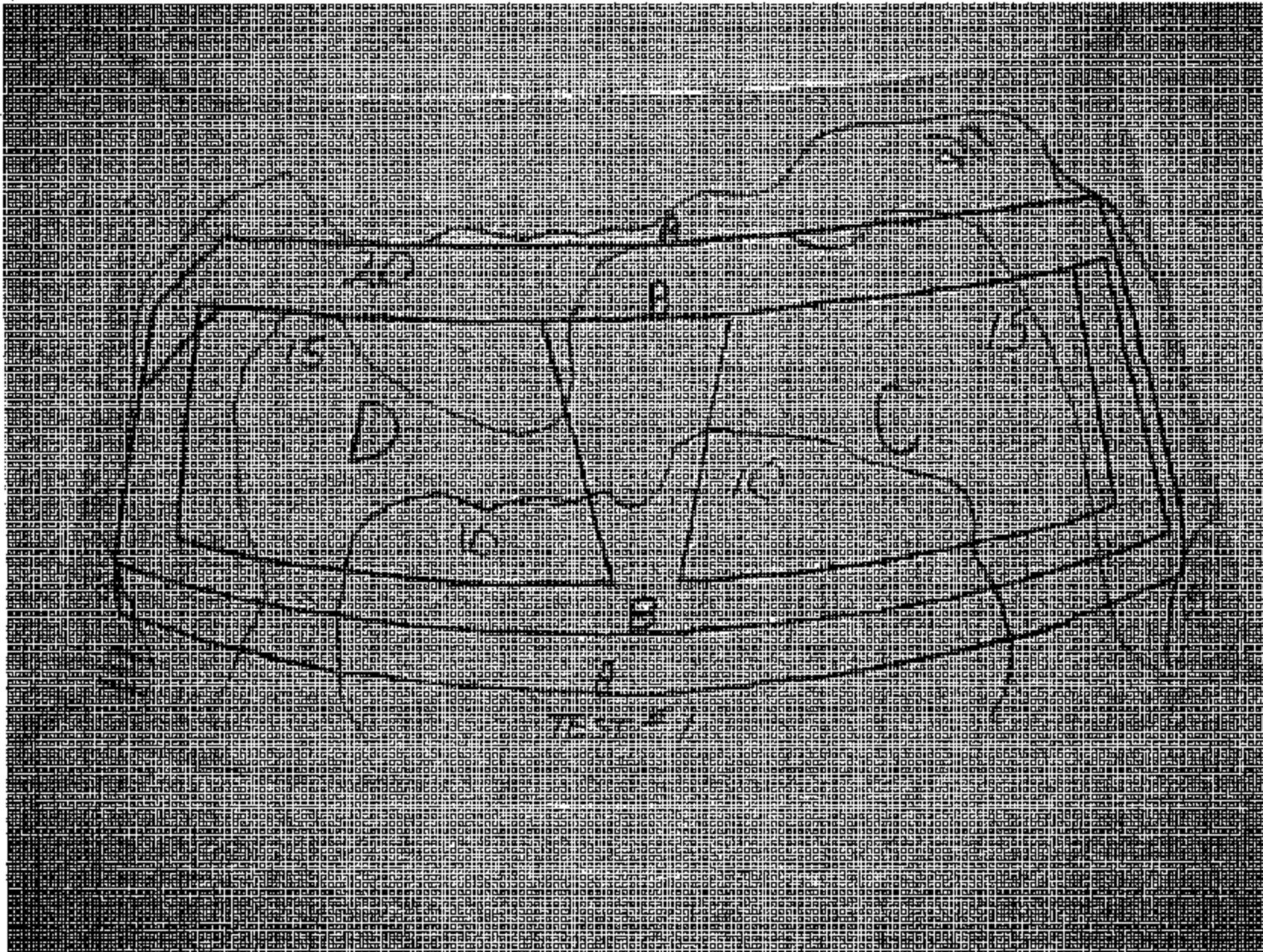
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.8
WINDSHIELD, PRE-TEST FROSTED STATE
TEST #1



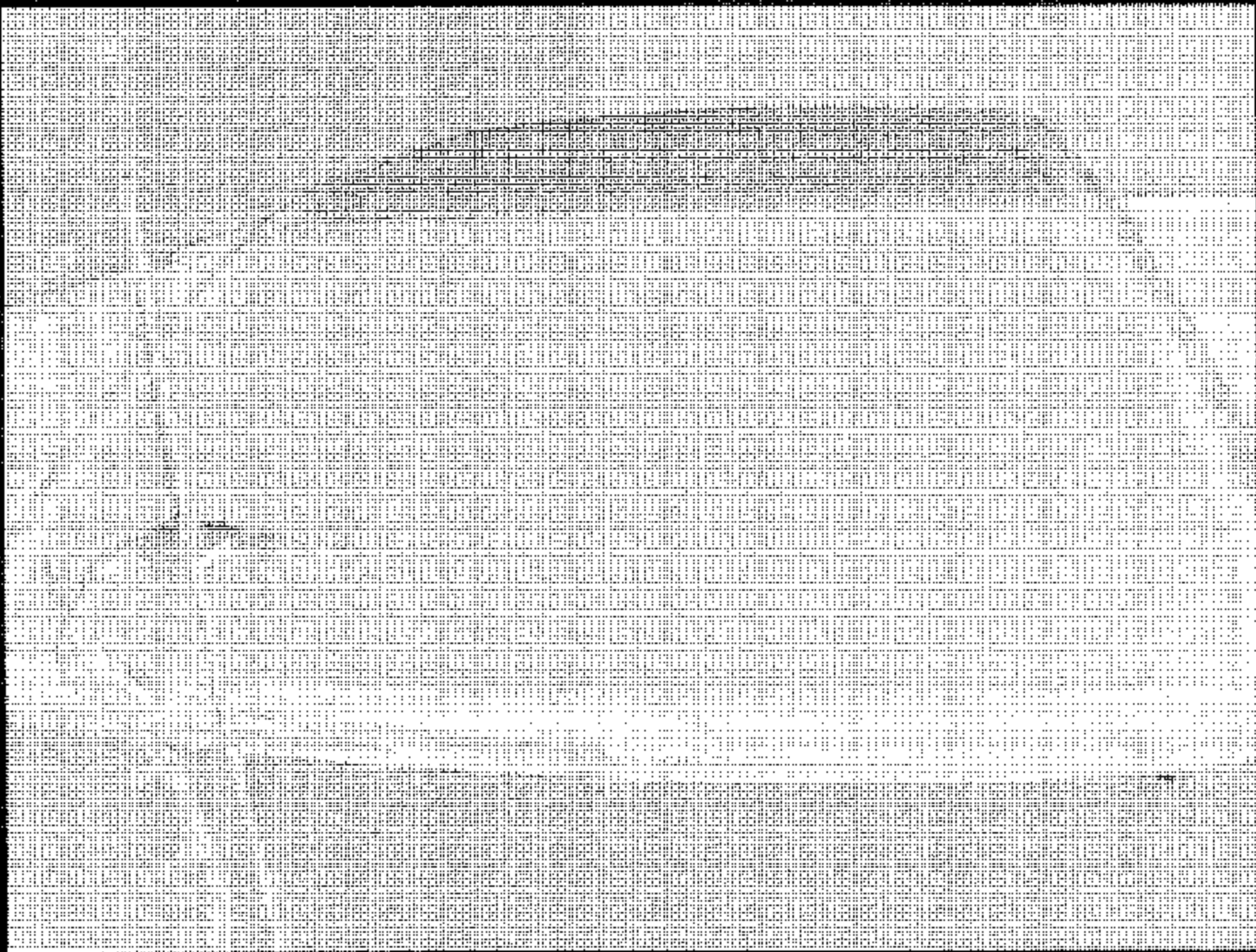
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.10
DEFROSTED AREA AT 20 MINUTES
TEST #1 END OF TEST



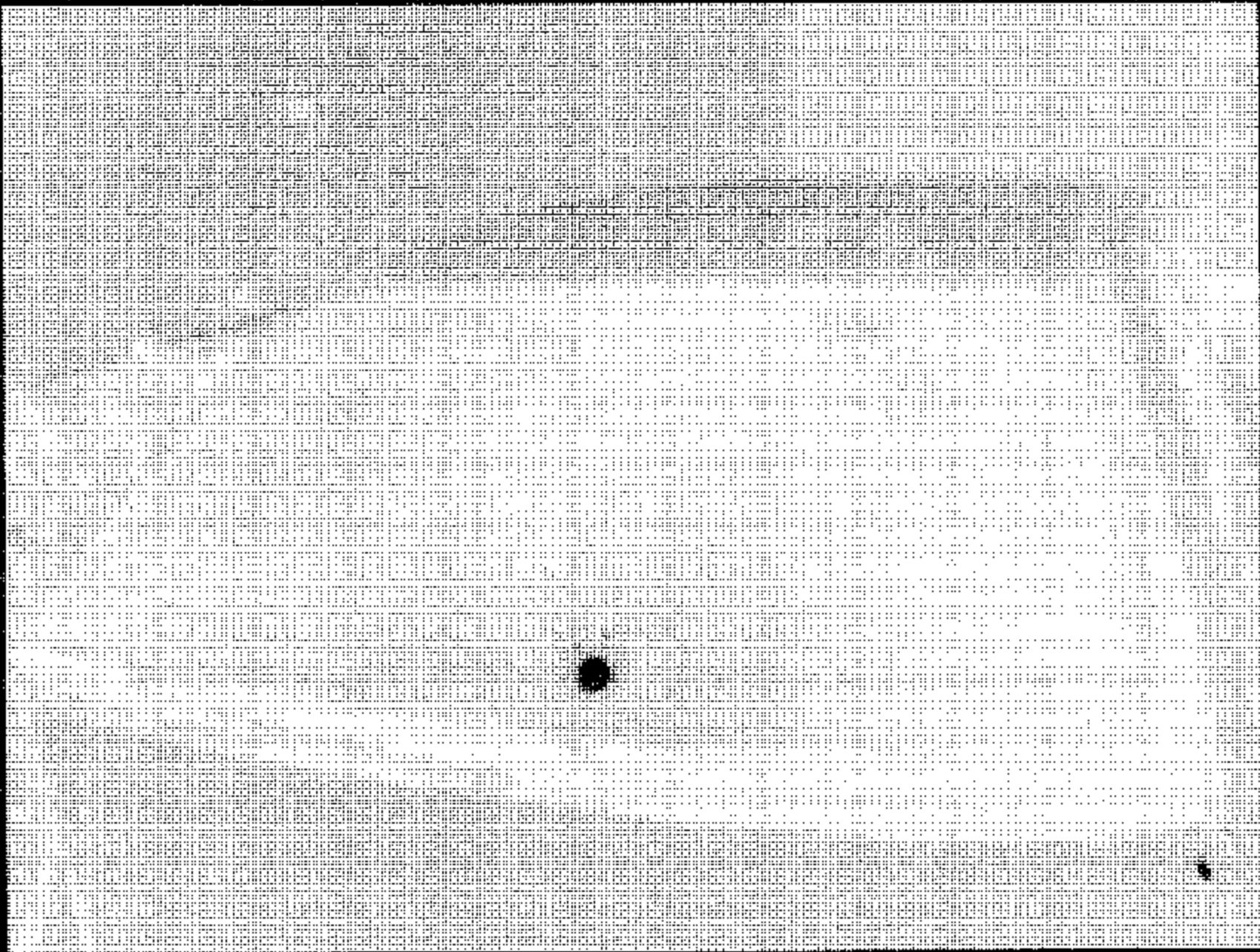
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.11
WINDSHIELD VELLUM PATTERN, POST
TEST #1



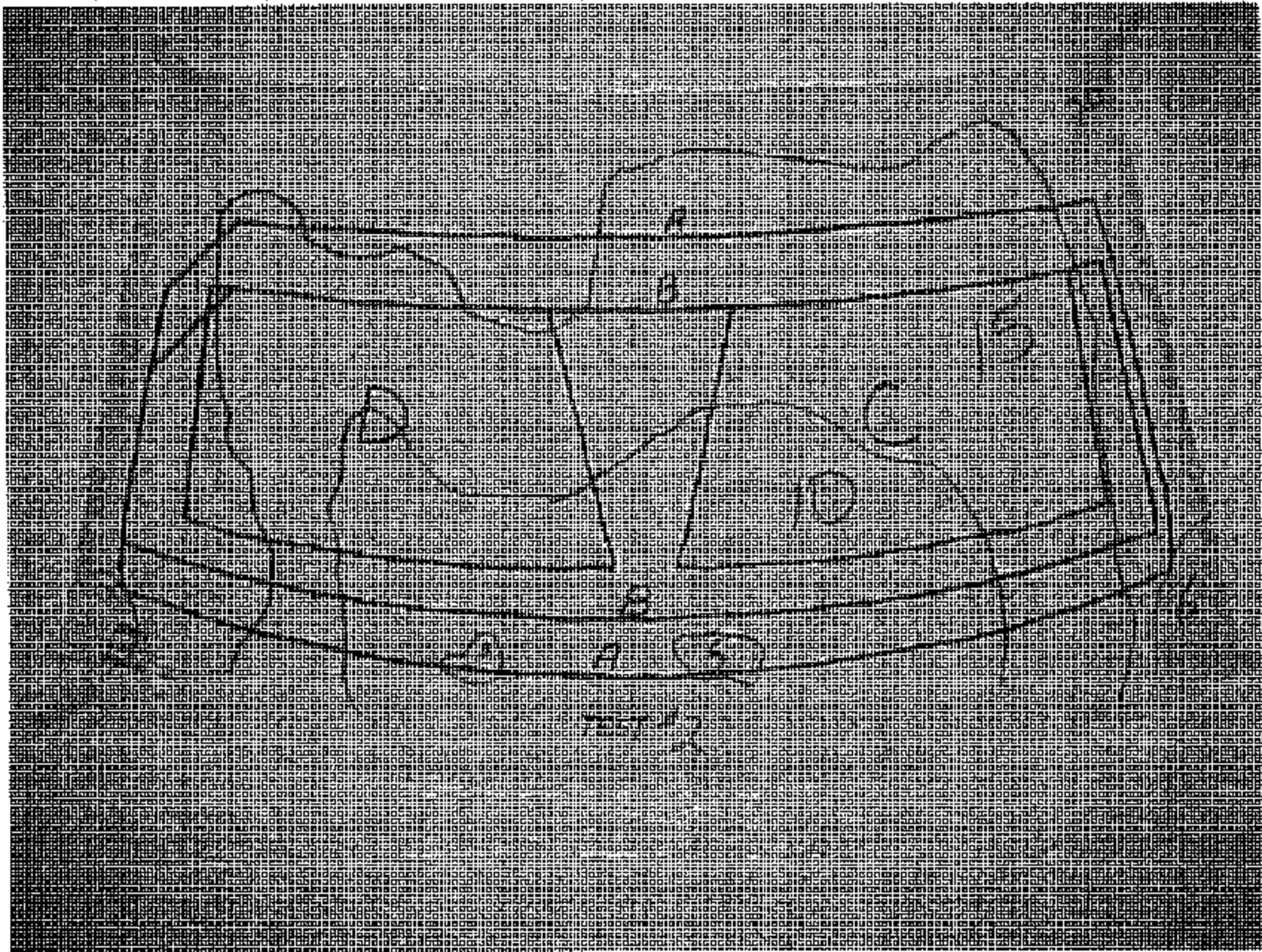
2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.12
WINDSHIELD, PRE-TEST FROSTED STATE
TEST #2



2004 CHEVROLET MALIBU
NHTSA NO. C40102
FMVSS NO. 103

FIGURE 5.13
DEFROSTED AREA AT 20 MINUTES
TEST #2



2004 CHEVROLET MALIBU
NHTSA NO. C#0102
FMVSS NO. 103

FIGURE 5.14
WINDSHIELD VELLUM PATTEN, POST
TEST #2


SECTION 6


OWNER'S MANUAL DEFROSTER INSTRUCTIONS

Defogging and Defrosting

Fog on the inside of windows is a result of high humidity (moisture) condensing on the cool window glass. This can be minimized if the climate control system is used properly. There are two modes to choose from to clear fog or frost from your windshield. Use the defog mode to clear the windows of fog or moisture and warm the passengers. Use the defrost mode to remove fog or frost from the windshield more quickly.

Turn the right knob to select the defog or defrost mode.

 (Defog): This mode splits the air between the windshield and the floor outlets with a small amount directed to the side windows. When you select this mode, the system turns off recirculation automatically and runs the air-conditioning compressor unless the outside temperature is at or below freezing. The recirculation mode cannot be selected while in the defog mode. Do not drive the vehicle until all the windows are clear.

 (Defrost): This mode directs most of the air to the windshield with some air directed to the floor vents. In this mode, the system will automatically force outside air into your vehicle and run the air-conditioning compressor. The air conditioning indicator light will blink three times if you try to turn off the compressor while in this mode. Recirculation cannot be selected while in the defrost mode.

To help clear the windshield quickly, do the following:

1. Select the defrost mode.
2. Select the outside air mode.
3. Select the highest temperature.
4. Select the highest fan speed.

Rear Window Defogger

The rear window defogger uses a warming grid to remove fog or frost from the rear window.

REAR: Press this button to turn the rear window defogger on or off. An indicator light will come on to let you know that the rear window defogger is activated. Be sure to clear as much snow from the rear window as possible.

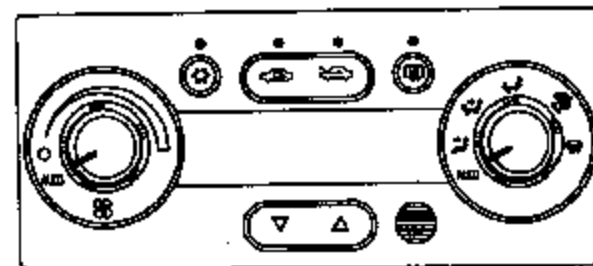
If driving below 50 mph (80 kph), the rear window defogger will turn off about 15 minutes after the button is pressed. If turned on again, the defogger will only run for about seven minutes before turning off. The defogger can also be turned off by pressing the button again or by turning off the engine.

If your vehicle's speed is maintained above 50 mph (80 km/h), the rear window defogger will remain on once the button is pressed.

Notice: Don't use anything sharp on the inside of the rear window. If you do, you could cut or damage the warming grid, and the repairs wouldn't be covered by your warranty. Do not attach a temporary vehicle license, tape, a decal or anything similar to the defogger grid.

Automatic Climate Control System

If your vehicle has this system, you can automatically control the heating, cooling and ventilation in your vehicle.



Automatic Operation

AUTO (Automatic): Select AUTO on both the fan control and the mode control knobs to activate the automatic system. When automatic operation is active the system will control the inside temperature and air delivery.

Use the steps below to place the entire system in automatic mode:

1. Place the fan knob and the mode knob to the AUTO position.

The display will now show the current set temperature. When auto is selected, the air conditioning operation and air inlet will be automatically controlled. The air conditioning compressor will run when the outside temperature is over about 40°F (4°C). The air inlet will normally be set to outside air. If it's hot outside, the air inlet may automatically switch to recirculate inside air to help quickly cool down your vehicle.

2. Set the temperature.

To find your comfort setting, start with an initial temperature setting and allow about 20 minutes for the system to regulate. Press the up or down arrow temperature buttons to adjust the temperature setting as necessary. If you choose the temperature setting of 60°F (15°C) the system will remain at the maximum cooling setting. If you choose the temperature setting of 80°F (32°C) the system will remain at the maximum heat setting. Choosing either maximum setting will not cause the vehicle to heat or cool any faster.

Be careful not to cover the sensor located on the top of the instrument panel near the windshield. This sensor regulates air temperature based on sun load, and also turns on your headlamps.


Also be careful not to cover the sensor grille on the lower right side of the climate control faceplate. This senses the inside vehicle temperature needed for proper regulation.


To avoid blowing cold air at start-up in cold weather, the system will delay turning on the fan until warm air is available. The length of delay depends on the engine coolant temperature. Turning the fan knob will override this delay and change the fan to a selected speed.


If your vehicle has the remote start feature, the climate control display will initially show "AS" in place of the temperature to indicate the remote start has been activated. The system will automatically regulate the temperature.


Manual Operation


You may manually adjust the air delivery mode or fan speed.

 (Off): Select this position on the fan knob to turn off the entire climate control system. Outside air will still enter the vehicle, and will be directed to the floor. This direction can be changed by changing the mode position. The temperature can also be adjusted using either the up or down arrow temperature buttons.


 (Fan): The knob with the fan symbol allows you to manually adjust the fan speed.


 (Vent): This mode directs air to the instrument panel outlets.

 (Bi-Level): This mode directs half of the air to the instrument panel outlets, and the remaining air to the floor outlets.

 (Floor): This mode directs most of the air to the floor outlets with some air directed to the side window outlets.

The right knob can also be used to select defog or defrost modes. Information on defogging and defrosting can be found later in this section.

 (Outside Air): Press the right side of the button to turn the outside air mode on. When this mode is on, outside air will circulate throughout your vehicle. When the button is pressed, an indicator light above the button will come on to let you know that it is activated. The outside air mode can be used with all modes, but it cannot be used with the recirculation mode. Pressing this button will cancel the recirculation mode.

 (Recirculation): Press the left side of the button to turn the recirculation mode on. This is helpful when you are trying to limit odors from entering your vehicle and for maximum air conditioning performance in hot weather. When the button is pressed, an indicator light above the button will come on to let you know that it is activated. The recirculation indicator light will blink three times if you try to use recirculation in a mode that it can not be used in. Only use this mode when it is needed for comfort, since window fogging will rapidly occur if the air conditioning compressor is not engaged.

Pressing this button cancels the auto recirculation feature. Each time the vehicle is started, the system will revert to the auto recirculation function.

If you select recirculation while in defrost, defog or floor, the light on the button will flash three times and go out to let you know this is not allowed. This is to prevent fogging.

When the weather is cool or damp, operating the system in recirculation for extended periods of time may cause fogging of the vehicle's windows. To clear the fog, select either defog or defrost. Make sure the air conditioning is on. You will want to allow the air conditioning to run automatically to help dehumidify the air.

Temperature Control: Press the up and down arrows to increase or decrease the temperature inside the vehicle.

☼ (Air Conditioning): Press this button to turn the air conditioning compressor on and off. A light above the button will illuminate when the air conditioning is on.

When air conditioning is selected or in AUTO mode, the system will run the air conditioning automatically to cool and dehumidify the air entering the vehicle.

On hot days, open the windows long enough to let hot inside air escape. This reduces the time it takes for your vehicle to cool down. Then keep your windows closed for the air conditioner to work its best.

On cool, but sunny days while using manual operation of the automatic system, use bi-level to deliver warm air to the floor and cooler air to the instrument panel outlets. To warm or cool the air delivered, press the temperature buttons to the desired setting.

In AUTO mode the system will cool and dehumidify the air inside the vehicle. Also while in AUTO mode, the system will maximize its performance by using recirculation as necessary.


Heating: On cold days when using manual operation of the automatic system, choose floor mode to deliver air to the floor outlets. To warm or cool the air delivered, push the temperature buttons to the desired setting.


If you want to use the automatic mode, turn the knob to AUTO and adjust the temperature by pressing the temperature buttons.

The heater works best if you keep the windows closed while using it.

Defogging and Defrosting


You can use either defog or front defrost to clear fog or frost from your windshield. Use the defog mode to clear the windows of fog or moisture. Use the front defrost button to defrost the front windshield.

 (Defog): Use this setting to clear the windows of fog or moisture. Turn the mode knob to this position to select this setting. This setting will deliver air to the floor and windshield outlets.

 (Defrost): Turn the mode knob to this position to defrost the windshield. The system will automatically control the fan speed if you select defrost from AUTO mode. If the outside temperature is 40°F (4°C) or warmer, your air conditioning compressor will automatically run to help dehumidify the air and dry the windshield. The air conditioning indicator light will blink three times if you try to turn off the compressor while in this mode.

Rear Window Defogger

If your vehicle has this feature, the lines you see on the rear window warm the glass. The rear window defogger uses a warming grid to remove fog from the rear window.

 (Rear): Press this button to turn the rear window defogger on or off. An indicator light above the button will come on to let you know that the rear window defogger is activated.

If driving below 50 mph (80 kph), the rear window defogger will turn off about 15 minutes after the button is pressed. If you need additional warming time, press the button again.

If your vehicle's speed is maintained above 50 mph (80 km/h), the rear window defogger will remain on once the button is pressed.

If your vehicle has heated mirrors this button will also activate them.

Notice: Using a razor blade or sharp object to clear the inside rear window may damage the rear window defogger. Repairs would not be covered by your warranty. Do not clear the inside of the rear window with sharp objects.